

# SOME DIGENETIC TREMATODES IN FISHES FROM THE BAY OF BISCAY AND NEARBY WATERS

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## SYNOPSIS

Sixteen species of digenetic trematodes are recorded from seventeen species of fishes caught in the Bay of Biscay and in waters off the north-west coast of Spain and the Atlantic coast of Morocco.

The following two species are described as new : *Bathycreadium biscayense* and *Steringophorus blackeri*. Seven of the remaining species are described, these are *Dolichoenterum longissimum* Ozaki, *Proserkhynchus crucibulum* (Rud.), *Lepidapedon rachion* (Cobbold), *L. elongatum* (Lebour), *Steganoderma abyssorum* (Odhner), *Neosteganoderma glandulosum* Byrd and (?) *Steringotrema divergens* (Rud.). The following new combinations are made : *Bathycreadium* [*Nicolla*] *elongatum* (Maillard) and *Neosteganoderma* [*Proctophantastes*] *polymixiae* (Yamaguti).

## INTRODUCTION

THE author was given the opportunity in 1971 to obtain parasitic worms from marine fishes, whilst accompanying a cruise of the Ministry of Agriculture, Fisheries and Food Research Vessel 'Cirolana', the primary purpose of which was to collect blood from hake for electrophoretic and chromosome studies. The collecting was carried out between the 1st and the 14th of January and was conducted primarily in the Bay of Biscay, but also in other areas, including the waters off the western coasts of Spain and Morocco. The locations of the stations mentioned in this report are shown on Fig. 1 and further details are given in Table 1.

The fish were caught by stern trawl and the alimentary tract removed from them. The stomach and intestine were separated before being opened up with scissors, and then the contents were shaken into a tube of sea-water. These tubes were kept for



FIG. 1. Map showing positions of stations mentioned in this report.

TABLE I  
Station List

Station No.	Date Jan. 1971	SHOR			HAUL		
		Latitude north	Longitude west	Depth (m)	Latitude north	Longitude west	Depth (m)
1	1st	47°10'	05°40'	650	not recorded	-	-
6	2nd	48°31'	08°51'	177	48°28'	09°11'	173
7	3rd	47°02'	05°40'	330	47°03'	05°33'	610
8	3rd	46°55'	05°18'	520	46°51'	05°18'	680
17	4th	46°47½'	05°08'	348	46°42½'	04°58½'	480
22	5th	45°25½'	03°16'	420	45°17½'	03°13'	680
24	6th	44°23'	02°12'	575	44°38'	02°12'	665
37	8th	45°54½'	06°36'	340	43°49½'	06°33'	350
38	8th	43°52½'	06°36'	280	43°55½'	06°44'	272
41	9th	43°58½'	08°23'	252	43°57½'	08°32'	304
43	10th	40°03½'	09°42'	450	40°11'	09°47'	460
44	10th	40°13'	09°37'	290	40°04'	09°38'	256
53	14th	33°45'	08°36'	236	33°42½'	08°40'	222
54	14th	33°43'	08°36'	360	33°47½'	08°26'	408



## SYSTEMATIC SECTION

Family **BUCEPHALIDAE** Poche, 1907*Dolichoenterum longissimum* Ozaki, 1924

(Fig. 2)

Host and locality : intestine of *Conger conger*, Stn. 7.

Twenty-three specimens were found, and these vary from 3.5 to 6.5 mm in length. The longer worms are less contracted and have a long narrow neck, and an elongate oval hindbody (Fig. 2a), but in the shorter contracted specimens there is little indication of a neck (Fig. 2b). Whilst, superficially, these two forms may appear distinct an examination of the internal morphology of the worms leaves no doubt that they are specifically identical. The cuticle has, imbedded in it, numerous narrow pointed spines.

The anterior sucker is surmounted by a thick muscular hood, which in an extended condition, bears seven to eight horn-like conical projections on the dorsal and lateral rims (Figs. 2c and d). In an extended condition the sucker is 0.53–0.68 mm in diameter. When contracted the sucker becomes almost globular, and the projections are less conspicuous, and apparently less numerous in some cases, and point inwards. The sucker in this condition measures 0.32–0.44 mm in diameter. The aperture of the sucker is subterminal, with a more or less narrow extension down the ventral surface.

The contraction or expansion of the worm also affects the anterior portion of the alimentary canal. In neither whole mounts nor serial sections was evidence of an oral sucker seen. The specimens lacking a neck bear a simple mouth situated closely behind the anterior sucker. A short prepharynx runs posteriorly to the somewhat transversely-oval pharynx measuring 0.3–0.32 mm × 0.21 mm. From the pharynx the intestine runs anteriorly to a point which may or may not be nearer to the anterior sucker than the pharynx, where it turns conversely to reach the hinder end of the body. In both extended and contracted specimens the intestine follows a transversely undulating course and reaches nearly to the posterior end of the cirrus-sac. The posterior limit of the intestine is not easy to make out in whole mounts as it is often obscured by the eggs in the uterus.

A sinus occurs at the posterior margin of the worm, normally in the median line, though contraction has, in some cases, displaced the opening to the left of the median line. Into it open the ducts of the male and female systems and of the excretory vesicle. The opening of the sinus does not appear to be surrounded by a sphincter. The elongate cirrus-sac, which, due to contraction, lies at an acute angle to the median line, measures 0.95 × 0.23–0.28 mm and possesses a fairly thick muscular wall. It contains an oval seminal vesicle, 0.38–0.43 mm × 0.23–0.25 mm, which occupies the anterior portion of the cirrus-sac. The pars prostatica passes out of the middle region of the seminal vesicle, and runs to near the posterior extremity of the cirrus-sac where it unites with a short muscular cirrus. The testes are transversely elongate, well separated one behind the other, and are situated in the

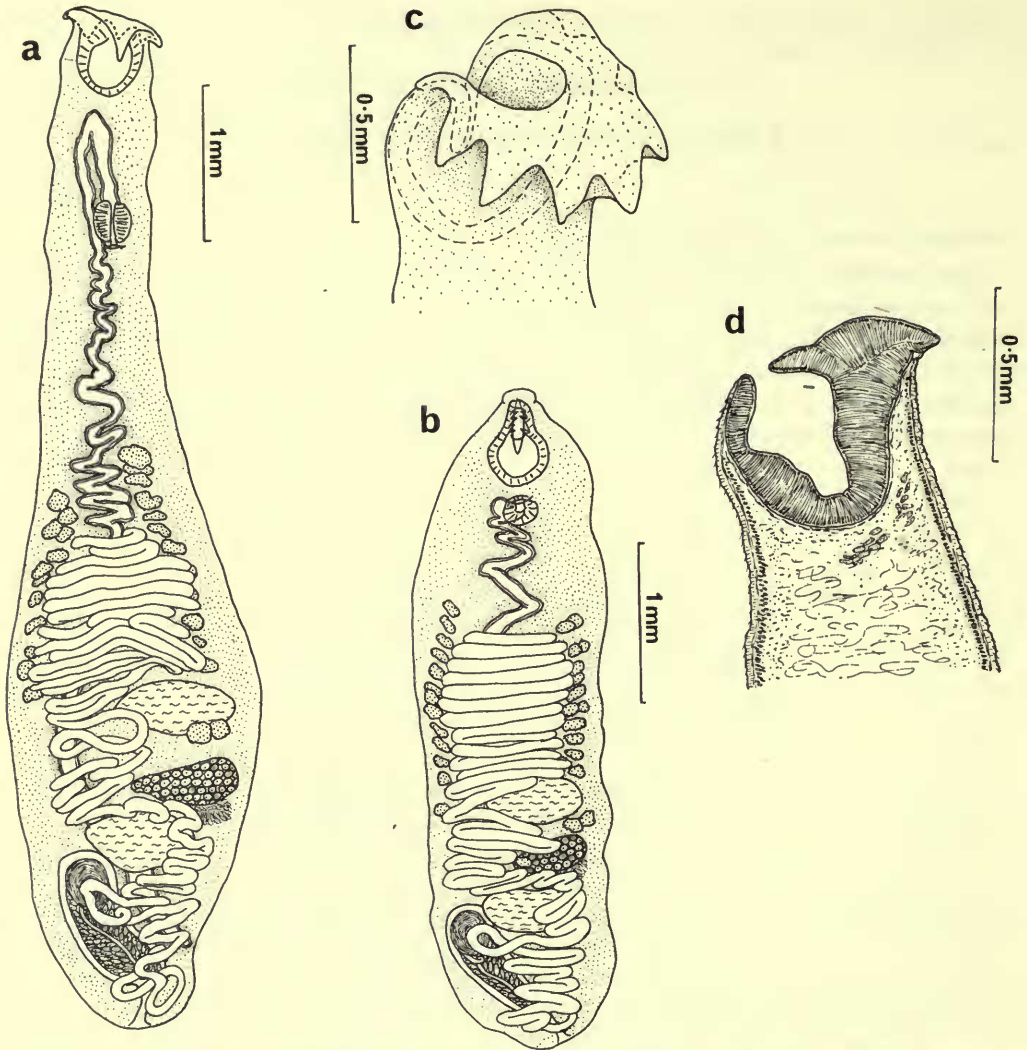


FIG. 2. *Dolichoenterum longissimum* Ozaki: a) extended specimen (ventral view); b) contracted specimen (ventral view); c) anterior sucker (dorso-lateral view); d) longitudinal section of anterior sucker.

middle region of the hinder half of the body. They are 0.56–0.84 mm × 0.22–0.41 mm. The ovary is also transversely elongate measuring 0.53–0.82 mm × 0.23–0.34 mm, and lies a little to the left of the median line between the testes. Directly behind it lies a large diffuse Mehlis' gland. Laurer's canal opens dorsally at about the level of the posterior testis. There appears to be no receptaculum seminis, but sperm is accumulated in the initial slings of the uterus, which is long and coiled running to a position some way anterior to the anterior testis before it turns and passes posteriorly, with many tightly-packed transverse slings. It passes into the posterior

region of the body, where it opens into the base of the genital sinus near the cirrus-sac, via a short muscular metraterm. There are numerous small eggs, many of which are collapsed, but measuring  $21-27 \mu\text{m} \times 12-18 \mu\text{m}$  when not collapsed. The vitelline follicles lie in two lateral groups, with about 12-16 follicles in each group, extending from about the level of the anterior testis to a position anterior to the foremost extent of the uterus. A few follicles also occur scattered between the testes.

The excretory vesicle opens into the genital sinus, and runs forward to a position just posterior to the posterior testis.

*Dolichoenterum longissimum* was originally described from *Conger myriaster* in Japanese waters. It has been found a number of times since in the same waters in *C. myriaster* (Ozaki 1928; Yamaguti 1938; Machida *et al.* 1970) and in *Muraenesox cinereus* (Yamaguti 1934). Prior to the present record, it has also been found in *Conger conger* in New Zealand waters (Manter 1954) and in two localities off the western coast of Scotland (Williams 1960).

Ozaki (1928) and Yamaguti (1934) disagree on the presence of a so-called 'urogenital' pore, that is, the common opening of the genital sinus and the excretory vesicle. Yamaguti states that Ozaki's figure 23 is misleading, and suggests that the 'genital sinus' is no more than a slight depression. Ozaki's figure, however, seems to accurately represent the condition in the present material. It would seem that the depth of the genital sinus is influenced somewhat by the contraction of the body.

Another feature which varies with the condition of the worm is the number and configuration of the projections surmounting the anterior sucker. Such a difference is, according to Tendeiro (1955), a major factor in separating *D. manteri* Tendeiro, 1955 (with only five projections) from *D. longissimum*. Tendeiro found a single specimen of *D. manteri* in *C. conger* from the Algarve coast of Portugal, and considered it distinct for a number of other reasons. The only one of these that appears to be a valid differentiating feature is the length of the intestine, which in *D. manteri* is said to extend only a little behind the middle region of the body. As Tendeiro had but one specimen it may have been that, as is the case in many of my specimens, it was not possible to trace the full extent of the intestine. If this were found to be so, then it seems probable that *D. manteri* should be considered a synonym of *D. longissimum*.

### ***Bucephalopsis gracilescens* (Rud., 1819) Nicoll, 1914**

Host and locality: intestine of *Lophius piscatorius*, Stn. 54.

This parasite occurred in great numbers. The shape of these worms varies considerably as indicated by Dawes (1947).

### ***Prosorhynchus crucibulum* (Rud., 1819) Odhner, 1905**

(Fig. 3)

*Monostoma crucibulum* Rud., 1819.

*Distoma crucibulum*: Dujardin, 1845.

*Gasterostomum crucibulum*: Gervais and van Beneden, 1859.

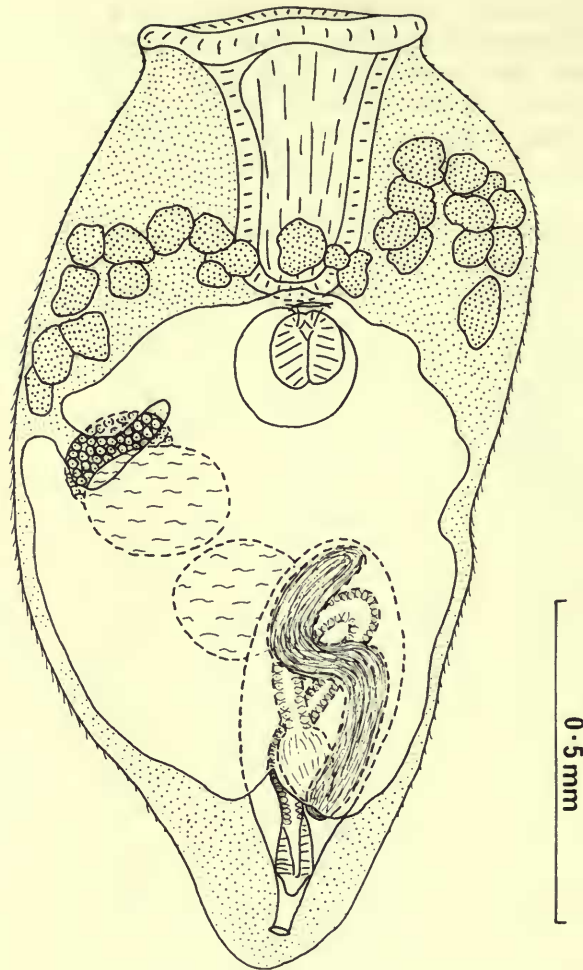


FIG. 3. *Prosorhynchus crucibulum* (Rud.): ventral view.

Host and locality: intestine of *Conger conger*, Stn. 7.

A single specimen was present, and it was examined as a whole mount and then in serial sections. It is a small worm, truncated anteriorly and pointed posteriorly, 1.5 mm in length and 0.87 mm in maximum width. The cuticle bears numerous scale-like spines. At the anterior end there is a muscular, funnel-shaped rhynchus, 0.48 mm across at its widest point and extending posteriorly to very near the intestine, that is, about 0.55 mm from the anterior end of the worm. A slit-like transverse mouth, 52  $\mu$ m across, is situated at about the anterior third of the body length, and near the base of the rhynchus. It leads immediately to a nearly globular pharynx, measuring 0.108  $\times$  0.115 mm, which in turn leads into a muscular oesophagus



0.07 mm long, thence into the saccular intestine, which lies dorsally to the pharynx and is about 0.2 mm × 0.16 mm.

The excretory pore is terminal posteriorly, and the excretory vesicle reaches to about the level of the anterior end of the cirrus-sac.

The genital sinus opens near to the posterior extremity of the body on the ventral side of the worm. A muscular cirrus-sac, 0.47 mm long by about 0.22 mm wide, reaches anteriorly to a position just in front of the anterior margin of the posterior testis. It contains a sigmoid seminal vesicle, which extends from the foremost extremity of the cirrus-sac to a position near to the posterior extremity, where it forms a muscular bulb before passing into an elongate pars prostatica. This latter organ runs nearly to the anterior of the cirrus-sac before passing posteriorly to where it unites with a relatively short muscular cirrus, which opens into the sinus at the base of the genital tongue. There is no indication of an external seminal vesicle. The testes lie one just posterior to the pharynx with the other just behind it. They are oval with smooth margins and measure 0.27 × 0.19 mm (anterior testis) and 0.21 × 0.2 mm (posterior testis). The ovary, of similar size and shape to the testes (0.2 mm dia.), lies just antero-dorsal to the anterior testis. The 'shell'-gland lies immediately posterior to the ovary, and Laurer's canal opens dorsally just posterior to the ovary. The vitellaria consist of about 25 irregular follicles lying more or less in an arc just behind the rhynchus and anterior to the pharynx and uterus. This latter organ is extensive in the region posterior to the pharynx, obscuring parts of the reproductive system in the whole mount. A short, muscular metratrem enters the genital sinus dorsally to the cirrus-sac. The eggs, which are very numerous and mostly collapsed, measure about 24–26 μm × 16–18 μm.

*Prosorhynchus crucibulum* is a common parasite of the conger and is morphologically very similar to another parasite of this fish, *P. aculeatus* Odhner, 1905, with which it has been synonymized by Dawes (1947). Brinkmann (1957) has given a number of reasons why he considers these species to be distinct, and, having examined a number of specimens assigned to both species in the collections of the British Museum (Natural History), I agree that the features selected by Brinkmann appear to be of value in distinguishing these species. The most noticeable difference is the size and shape of the rhynchus, which in *P. aculeatus* is small and rounded, and in *crucibulum* is larger and triangular or funnel-shaped. This character appears to be fairly constant, and according to Matthews (1973) the typical shape of the rhynchus in *P. crucibulum* is developed in the metacercaria during its first month in the second intermediate host. As can be seen, the present specimen fits *P. crucibulum* in this, as well as the other less prominent characteristics.

#### Family OPECOELIDAE Ozaki, 1925

#### *Helicometra fasciata* (Rud., 1819) Odhner, 1902

Host and locality : intestine of *Gaidropsarus vulgaris*, Stn. 22.

One specimen was present.

*Bathycreadium biscayense* sp. nov.

(Fig. 4)

Hosts and localities : caeca and intestine of *Trachyrhynchus trachyrincus* (type-host), Stn. 7, Stn. 24 ; caeca and intestine of *Coelorinchus caelorhynchus*, Stn. 1 ; intestine of *Lepidion eques*, Stn. 1.

This species occurred commonly in *T. trachyrincus*, in smaller numbers in *C. caelorhynchus* and only one specimen was found in *L. eques*.

The worm is elongate oval with lateral margins roughly parallel for much of its length, which varies between 0.4 mm and 1.7 mm. The maximum width, which normally occurs at the level of the ventral sucker, is 0.19–0.42 mm. The tegument is not armed, but bears annular wrinkles, probably due to contraction. Circular and subterminal, the oral sucker measures 0.065–0.14 mm in diameter and leads, without an apparent prepharynx, into a globular pharynx 0.032–0.066 mm in diameter. The oesophagus, up to 0.13 mm in length and lined with a cuticle, bifurcates at about the anterior margin of the ventral sucker. The intestinal caeca reach to near the posterior end of the worm, where they unite to form a cyclocoel. The ventral sucker is situated close behind the oral sucker in the anterior quarter or third of the body. It is often situated on a slight protuberance, and is transversely elongate, its transverse diameter being 0.19–0.29 mm, thus giving an oral : ventral sucker ratio of 1 : 2.2–3.5.

The excretory pore is terminal, and the cylindrical vesicle reaches to the ovary.

The genital pore occurs just to the left of the median line, closely anterior to the ventral sucker. Into it opens a claviform cirrus-sac measuring 0.25–0.4 mm × 0.05–0.085 mm, which normally reaches just posteriorly to the ventral sucker, and its posterior extremity lies amongst the uterine coils. It contains a convoluted internal seminal vesicle, a relatively short, oval pars prostatica and a long muscular cirrus. The testes are situated in tandem, close together, in the middle third of the body. They are usually wider than long with entire or slightly indented margins and measure in mature specimens 0.08–0.12 mm × 0.12–0.15 mm (anterior testis) and 0.09–0.12 mm × 0.12–0.15 mm (posterior testis).

The ovary is situated anteriorly and adjacent to the foremost testis, usually in the median line, but sometimes moved to one side or the other by the development of the uterus. It is normally wider than long, oval, with smooth margins and measures 0.025–0.065 × 0.083–0.1 mm. There appears to be a seminal receptacle lying dorsally to the ovary, but, despite several attempts, it has not been possible to obtain satisfactory serial sections of the female complex, so whether this is a true seminal receptacle or part of the uterus has not been determined, nor has the course of Laurer's canal, if present. The vitellaria consist of numerous oval follicles in lateral fields reaching from about the posterior border of the ventral sucker to near the posterior end of the worm. Behind the posterior testis the fields meet in the ventral plane, and come close together in the dorsal, being separated only by the excretory vesicle. Between the testes, and between the anterior testis and the ovary the follicles may extend towards the median line, but do not reach it. The vitelline fields are sometimes interrupted opposite the ovary and the testes. The

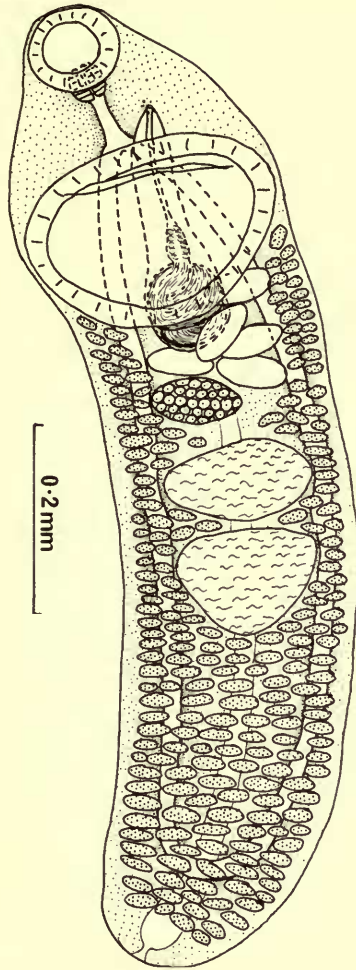


FIG. 4. *Bathycreadium biscayense* sp. nov.: specimen from *Trachyrhynchus trachyrincus* (ventral view).

uterus runs from the ovary to the posterior margin of the ventral sucker, and contains a few (up to about 10) large eggs. These measure  $80-92 \mu\text{m} \times 43-52 \mu\text{m}$ .

**MATERIAL.** British Museum (Nat. Hist.) Reg. no. 1973.4.9.1-20 (syntypes).

*Bathycreadium* Kabata, 1961, has been reduced to synonymy with *Nicolla* Wisniewski, 1933, by Slusarski (1971). Kabata did not compare the two genera so it was left to Pritchard (1966) to list the differences between them. Slusarski dismisses Pritchard's diagnostic characters by saying that they are too variable in *Nicolla*, and he is probably correct in this assumption in respect of most of these characters. It does seem, however, that at least one character mentioned by Pritchard may be used in separating these two genera, along with another feature she did not mention.

As she noted, it appears that in all the species of *Nicolla* (with one exception, i.e. *N. elongata*) the vitellaria reach anteriorly to the ventral sucker, whilst in *Bathycreadium* they do not reach further forward than the posterior margin of the ventral sucker. It is also apparent that the normal situation of the posterior testis in *Nicolla* is close to, or contiguous with, the cyclocoel with few or no vitelline follicles between the posterior testis and the intestinal arch (again *N. elongata* is an exception). In *Bathycreadium* there is at least a testis diameter, usually considerably more, between the posterior testis and the cyclocoel, and the bulk of the vitellaria is in this region. From its differentiating characteristics it is evident that *Nicolla elongata* Maillard, 1970, from *Onos tricirratatus* in the Gulf of Lion should be assigned to *Bathycreadium elongatum* (Maillard, 1970) n. comb.

It may also be mentioned here that the concept of *Bathycreadium* as given above is close to that of *Coitocaecum* Nicoll, 1915, as represented by Yamaguti (1971). He seems to be in error, however, in stating that the cirrus-sac is 'retort-shaped containing elongate saccular or tubular seminal vesicle, prostatic complex and ejaculatory duct' in *Coitocaecum*. The type-species of this latter genus, *C. gymnophallum* Nicoll, 1915, has, according to the original author, 'no true cirrus-pouch', while Crowcroft (1951) who re-examined Nicoll's material states that there is 'a small membranous cirrus-sac enclosing a short, terminal portion of the male duct'.

*B. biscayense* differs from the other two species in the genus, *B. flexicollis* Kabata, 1961, and *B. elongatum* (Maillard, 1970), in the anterior extent of the vitellaria, in the proximity of the testes and the ovary and in the sucker-ratio. It also appears that it normally contains fewer eggs than the other species. The egg-size of *B. biscayense* differs greatly from that of *B. elongatum*, but is similar to that of *B. flexicollis* as corrected by Pritchard (1966) and verified by the author from paratype specimens in the collections of the British Museum (Natural History).

#### Family LEPOCREADIIDAE Nicoll, 1935

#### *Lepidapedon rachion* (Cobbold, 1858) Stafford, 1904

(Fig. 5)

*Distomum rachion* Cobbold, 1858.

*Lepodora rachiaea*: Odhner, 1905.

Host and locality: intestine of *Phycis blennoides*, Stn. 17.

Nine contracted specimens were present. They are small worms 0.66–1 mm long and 0.27–0.44 mm wide, being widest behind the ventral sucker, and tapering towards the anterior end. The cuticle bears rows of closely-set narrow pointed spines. The oral sucker is subterminal, measuring 0.097–0.115 mm in diameter, and leads into a prepharynx which, when apparent, varies in length up to 44  $\mu$ m and is usually, but not invariably, longer than the oesophagus, which may reach a length of 28  $\mu$ m. The pharynx is large and pyriform 0.09–0.13 mm  $\times$  0.066–0.106 mm. The intestinal bifurcation occurs close to the ventral sucker, and the caeca, which reach to the posterior end of the body, are wide. The rounded ventral sucker lies in the anterior

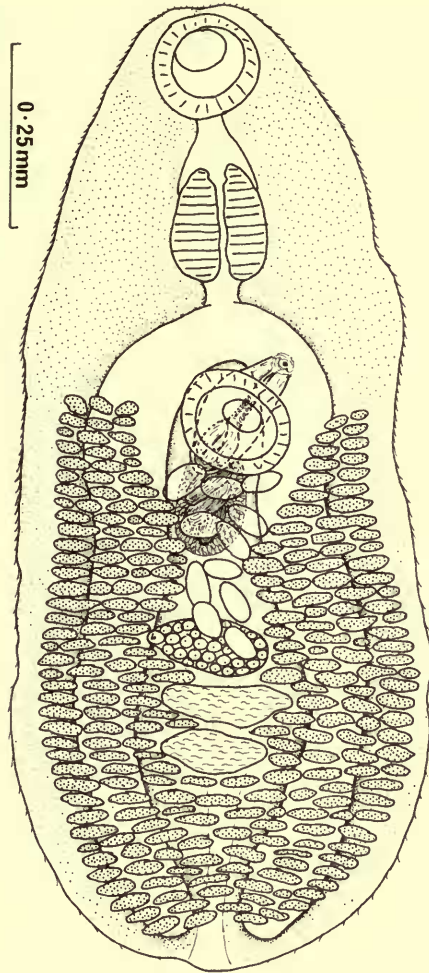


FIG. 5. *Lepidapedon rachion* (Cobbold) : ventral view.

half of the worm, and measures 0.08–0.12 mm in diameter, giving an oral : ventral sucker ratio of 1 : 0.75–1.08. Only in the largest specimen was the ventral sucker slightly larger than the oral, whilst in the other specimens the oral sucker was distinctly larger than the ventral.

The excretory pore is terminal and leads into a simple elongate excretory vesicle, which has been traced as far forward as the posterior testis.

The genital pore occurs closely anterior to the ventral sucker and to the left of the median line ; in fact, it lies ventrally to the left caecum. The muscular cirrus-sac reaches to near the posterior margin of the ventral sucker, measures about 0.09 mm in length and contains a coiled, tubular, seminal vesicle and a pars prostatica, which is slightly longer than the short muscular cirrus. The external seminal vesicle is

also tubular and is coiled amidst a mass of gland-cells. This mass of cells extends behind the ventral sucker and is surrounded by a thin membrane. In the posterior third of the body lie the testes, in tandem formation. They are transversely elongate, have smooth or indented margins and measure 0.1–0.14 mm × 0.03–0.05 mm (anterior) and 0.08–0.14 mm × 0.04–0.06 mm (posterior).

The ovary lies just anteriorly to the foremost testis in the median line and is separated from the ventral sucker by the uterine coils. It is transversely elongate, measuring 0.08–0.13 mm × 0.04–0.07 mm, with smooth or slightly indented margins. Dorsal to the ovary lies a globular receptaculum seminis. The vitelline glands are numerous and reach anteriorly as far as about the middle level of the ventral sucker. They lie laterally and ventrally to the intestinal caeca and reach inwardly to the gonads, and although they intrude between the gonads they do not meet in the median line. Posteriorly to the testes, however, the vitelline fields are confluent in the median line. The uterine coils lie between the ovary and the ventral sucker and contain eggs, all of which, in the present specimens, are collapsed. In this condition they measure about 57–60  $\mu$ m in length.

These worms are recognizable as *Lepidapedon rachion* despite the fact that, presumably due to contraction, the worms are on average shorter than is normal for this species. This parasite is fairly common in Gadidae in the northern Atlantic, but has not, apparently, been recorded from this host before.

***Lepidapedon elongatum*** (Lebour, 1908) Nicoll, 1910

(Fig. 6)

*Lepidodora elongatum* Lebour, 1908.

Hosts and localities : intestine of *Lepidion eques*, Stn. 1 ; intestine of *Trachyrhynchus trachyrincus*, Stn. 1, Stn. 7, Stn. 24.

These worms were common in the intestine of both hosts. Their normal shape appears to be elongate oval, but some of the present specimens are contracted to a more pyriform shape, whilst some, taken from a frozen specimen of *L. eques*, are very elongate in the forebody. The length of the worm varies between 0.73 mm and 2.1 mm, and the width between 0.17 mm and 0.42 mm. The cuticle bears rows of narrow pointed spines. Rounded and subterminal, the oral sucker measures 0.09–0.17 mm in diameter. The ventral sucker, which is situated in the middle third of the body, is also rounded and measures 0.06–0.13 mm in diameter. The oral : ventral sucker ratio is 1 : 0.55–1. The prepharynx in grossly contracted specimens is not apparent, but in less contracted specimens it varies greatly in length, measuring up to 0.6 mm in one specimen from a frozen *L. eques*. Normally, the variation appears to be between about 0.01 mm and 0.1 mm. The pharynx is longer than wide, measuring 0.06–0.14 mm × 0.04–0.12 mm and has a tendency to be of a similar size to or somewhat larger than the ventral sucker. It leads into the oesophagus which, like the prepharynx, varies considerably in length, and is usually shorter than the prepharynx, being 0–0.06 mm in length. It bifurcates about midway

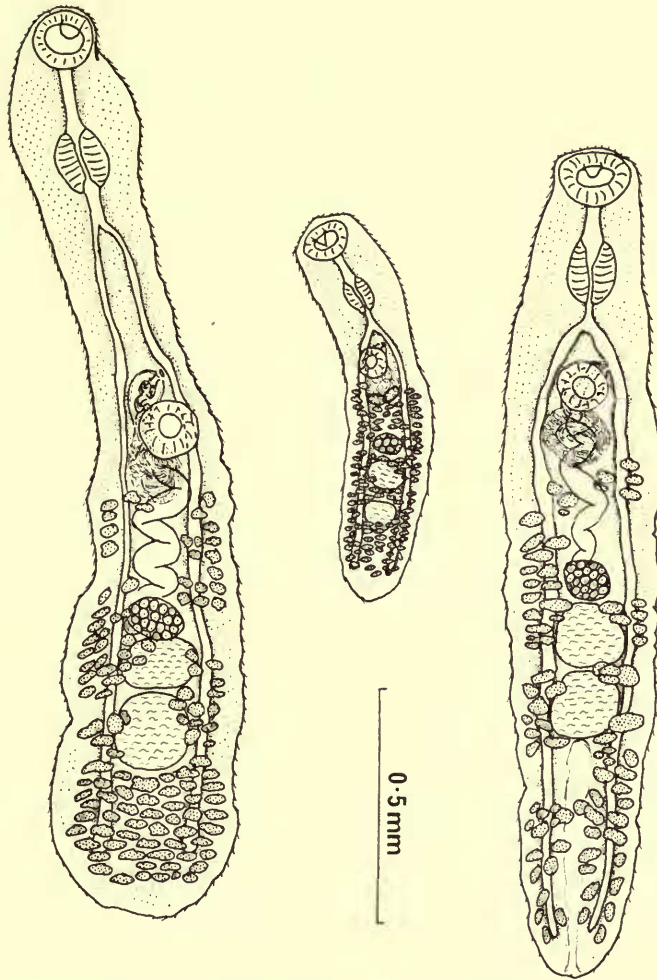


FIG. 6. *Lepidapedon elongatum* (Lebour) : three specimens from *Trachyrhynchus trachyrincus* (ventral view).

between the suckers or nearer to the ventral sucker. The caeca, lined with a deeply staining epithelium, reach to near the posterior end of the body.

The excretory pore is terminal and leads into a simple tubular vesicle which has been traced anteriorly to the level of the hinder margin of the hinder testis.

The genital pore is situated to the left of the median line close to the anterior margin of the ventral sucker or more further forward. The strongly muscular, oval cirrus-sac measures about 0.07–0.14 mm × 0.04–0.09 mm, but is not easy to measure satisfactorily due to the angle at which it lies to the body surface. It contains a coiled tubular seminal vesicle, a distinctly widened pars prostatica and a muscular cirrus. The internal seminal vesicle leads, via a narrow canal, into a convoluted

external seminal vesicle surrounded by gland-cells. These cells are in turn surrounded by a very thin membrane, and reach to a position well posterior to the ventral sucker. The testes have smooth margins and are either transversely elongate or rounded. They are arranged in tandem at about the middle of the hindbody. The anterior testis measures 0.08–0.22 mm × 0.04–0.13 mm and the posterior 0.09–0.2 mm × 0.04–0.16 mm. There is a narrow space between the testes, and also between the anterior testis and the ovary, which lies in the median line, and is separated from the ventral sucker by the uterine coils. Like the testes it may be either transversely elongate or rounded, and measures 0.06–0.17 mm × 0.04–0.11 mm. The seminal receptacle lies dorsally to the ovary and Laurer's canal runs to the dorsal surface at about the same level. The vitelline glands do not reach anteriorly as far as the ventral sucker, but terminate on a level with the hinder end of the external seminal vesicle, or thereabouts. The follicles lie mostly in a plane ventral to the intestinal caeca, with some lateral to them. The lateral vitelline fields may be interrupted beside the ovary and testes and may reach to the median line between these organs, and also ventrally to the uterus. Behind the testes the fields usually merge in the median line, but sometimes the excretory vesicle appears to form a barrier between them. The uterus runs between the ovary and the ventral sucker, and opens into the genital atrium through a muscular metraterm of about the same length as the cirrus-sac. The uterus contains numerous eggs, the few uncollapsed ones measuring 58–65  $\mu\text{m}$  long by about 30  $\mu\text{m}$  wide.

Several authors have used the name *Lepidapedon elongatum* for specimens described from various species of fishes from the west and east coasts of North America (Manter 1926; Linton 1940; Ching 1961), the Pacific coast of Panama (Caballero y C. *et al.* 1955), Bombay (Gupta and Sehgal 1971), the Black Sea (Skrjabin and Koval 1960) and the Barents Sea (Dogiel 1936), in addition to those originally described from *Gadus morhua* on the Northumberland coast of England by Lebour (1908). The variation represented in these descriptions indicates that more than one species may be involved. The position is further complicated by the descriptions of very similar trematodes under other names, for example, *Lepidapedon coelorhynchi* Yamaguti, 1938, *L. gadi* (Yamaguti, 1934) and *L. microcotyleum* Dollfus, 1953. It seems that the latter two species may be distinguished from Lebour's form by egg-size, although their egg-size overlaps some of the later descriptions of '*L. elongatum*'. *L. coelorhynchi* was considered a synonym of *L. elongatum* by Hanson (1950) and this has been accepted by most subsequent authors.

The specimens described above differ from Lebour's description in that most of them have a ventral sucker distinctly smaller than the oral. She gives measurements of only one specimen, the ventral sucker being 0.12 mm across and the oral, 0.1 mm across. It should be noted, however, that in her figure the ventral sucker appears to be slightly smaller than the oral. The distribution of the vitellaria between the ovary and the ventral sucker is rather variable and probably not a good feature to use for differentiating species in this group, as was suggested by Polyanski (1955). Figure 6 illustrates variation in three specimens from the intestine of the same specimen of *T. trachyrincus*, but at the same time they also show a certain constancy of morphological features.



Family **AZYGIIIDAE** Odhner, 1911**Otodistomum veliporum** (Creplin, 1837) Stafford, 1904

Host and locality : intestine of *Dalatias licha*, Stn. 1.

This trematode has been reported from this host by a number of authors, including Dollfus (1937) who records it from the Bay of Biscay, off Biarritz, and also gives a list of previous records. Since then it has been found in this host in Norwegian waters by Bråten (1964) and in the Cook Strait, New Zealand, by Manter (1954).

Family **ZOOGONIDAE** Odhner, 1911**Steganoderma abyssorum** (Odhner, 1911) Manter, 1947

(Fig. 7)

*Proctophantastes abyssorum* Odhner, 1911.

*Deretrema abyssorum* : Price, 1934.

Hosts and localities : intestine of *Trachyrhynchus trachyrincus*, Stn. 1, Stn. 7, Stn. 24 ; intestine of *Coelorinchus caelorhinchus*, Stn. 1, Stn. 37 ; intestine of *Lepidion eques*, Stn. 1.

The degree of contraction of the fixed worms varies considerably so that the shape varies from a very elongate pyriform to a short, broadly pyriform. The length is between 0.62 mm and 1.66 mm and the greatest width is 0.28–0.63 mm, which occurs invariably at the region of the ventral sucker. The rounded oral sucker is subterminal, 0.18–0.32 mm in diameter, whilst the ventral sucker is considerably larger, situated somewhat posteriorly to the middle of the worm, and is wider than long, being 0.25–0.6 mm across by 0.18–0.44 mm. Transversely across the inside of the ventral sucker runs a low muscular ridge. The oral : ventral sucker width ratio is 1 : 1.08–2.1 and the sucker-length ratio is 1 : 0.9–1.6. Only in extended specimens is a prepharynx to be seen, and it reaches to no greater length than 0.04 mm. The small globular pharynx has a diameter of 0.03–0.08 mm and from it leads an oesophagus which varies greatly in length between 0.08–0.22 mm. In grossly contracted specimens it has not been observed. It bifurcates about halfway between the suckers and the caeca are fairly short, terminating dorsally to the testes or vitellaria.

The excretory pore is terminal and leads into a vesicle which reaches forward, dorsally to the uterus, for an undetermined distance and as far as can be seen is a simple tube.

Approximately on a level with the intestinal bifurcation, in a submarginal position, lies the genital pore. The cirrus-sac reaches past the anterior margin of the ventral sucker, and in contracted specimens nearly reaches to the transverse ridge, measuring 0.2–0.37 mm × 0.06–0.09 mm. It contains a coiled seminal vesicle, the coils of which are often tightly packed, a well-developed pars prostatica invested with a mass of gland cells and a cirrus, of about one-third the length of the cirrus-sac. The proximal half of the cirrus appears to be lined with a cuticle which may be thrown in wrinkles. The two oval or elongate oval testes are always partly obscured by the

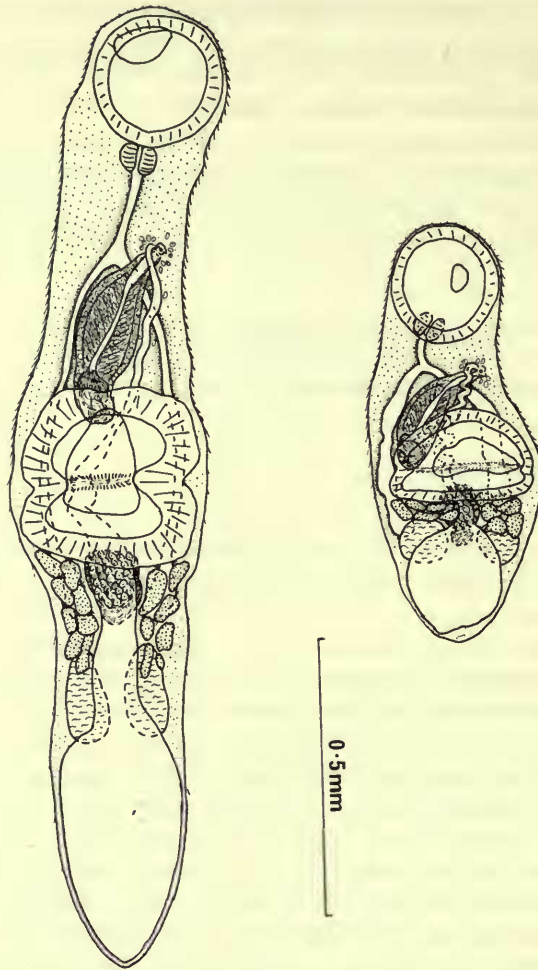


FIG. 7. *Steganoderma abyssorum* (Odhner): two specimens from *Trachyrhynchus trachyrincus* (ventral view).

eggs or the vitelline glands and lie symmetrically one on each side of the body, separated from the posterior border of the ventral sucker by some of the vitellaria. They measure about 0.16–0.22 mm × 0.13–0.2 mm.

The rounded ovary is smaller than the testes, being about 0.15 mm in diameter. It is situated more or less on the posterior border of the ventral sucker, but sometimes entirely posterior or anterior to it. Posteriorly and dorsally to the ovary lies the rounded or oval seminal receptacle, which is rather smaller than the ovary. Immediately posterior to the ventral sucker, in two symmetrical lateral groups, are the vitellaria, which lie somewhat ventrally to the testes, and overlap them in varying degrees. There are between five and ten follicles in each group. The uterus fills

most of the area posterior to the ventral sucker, and therefore in the majority of specimens the details of the reproductive organs are obscured. It contains numerous operculate eggs measuring 34–41  $\mu\text{m}$  long by 16–21  $\mu\text{m}$ . The metraterm is long, muscular and helical. It enters a small, muscular genital atrium, which is surrounded by a scattering of glandular cells.

This species was originally described as the type-species of the genus *Proctophantastes* Odhner, 1911, from *Macrurus (Coryphaenoides) rupestris* and *Gadus aeglefinus* from Norway. Price (1934) considered *Proctophantastes* to be a synonym of *Deretrema* Linton, 1910, but this synonymy was questioned by Manter (1947) who considered it a synonym of *Steganoderma* Stafford, 1904. Odhner (1911a) does not discuss the relationship of *Proctophantastes* with either of the genera with which it has been synonymized. Whilst Price (1934) makes his synonymy with little comment, Manter (1947) discusses the relationship of the three genera in some detail. As has been mentioned above, the latter author considers *Proctophantastes* to be a synonym of *Steganoderma* and he suggests that the differences between the type-species of *Steganoderma*, *S. formosum* Stafford, 1904, and *P. abyssorum* are of specific rather than generic value. These differences are in sucker-size, oesophagus-length and length of vitelline fields. The present author agrees with Manter's conclusion. Therefore, the differences Manter (1947) indicates between *Steganoderma* and *Deretrema* also apply to *Proctophantastes* when compared with *Deretrema*. In short, Price's synonymy is rejected, because the vitellaria in *Deretrema* do not reach posteriorly to the ventral sucker, whilst in *Steganoderma* and *Proctophantastes* the majority of the vitellaria are situated in this region. Subsequent to Manter (1947), only Yamaguti (1953, 1958, 1970, 1971) has continued to consider *Proctophantastes* a valid genus. The features he uses to distinguish *Proctophantastes* from *Steganoderma* are, I believe, not sufficient to uphold the genus. In 1953 he indicates that in *Proctophantastes* the vitellaria are compact, while in *Steganoderma* they are in longitudinally elongate groups. This type of difference would appear to be of specific rather than generic importance, as it concerns fairly small details of the vitelline extent. Yamaguti (1958) distinguishes the genera on the shape of the cirrus-sac and the position of the ventral sucker. An examination of Miller's (1941) redescription of Stafford's specimen of *S. formosum*, and also of the other descriptions of this species given by Manter (1925, 1926), Linton (1940), Ching (1960), Ronald (1960) and Strelkov (1960) shows that the cirrus-sac of this species resembles that of *P. abyssorum* in shape. The ventral sucker in this latter species lies just behind the middle of the body, while in *S. formosum* it lies just anterior to the centre of the body. This condition probably varies with the contraction or growth of the specimen, so that its value as a generic character is rather doubtful. In 1970, Yamaguti suggested that a 'profusely developed "peritrial gland" may be a generic, not a specific character, though not mentioned by Odhner'. He is referring to a character present in a new species he is describing, and this character is, I believe, a feature of *Neosteganoderma*, and is discussed in connection with the following species. The few scattered gland-cells around the genital atrium in the present specimen do not, it appears, represent a feature of generic importance, and, moreover, similar glands have been described in other species of *Steganoderma*, e.g. *S. elongatum* Manter, 1947.

Finally, Yamaguti (1971) upholds *Proctophantastes* on account of the characteristic structure of the genital atrium. There is, however, no peculiar feature in the genital atrium of the present specimens, nor is it indicated in Odhner's generic definition where he merely says 'Genitalsinus ziemlich klein'. As the various attempts to validate *Proctophantastes* do not appear convincing, this genus is here considered to be a synonym of *Steganoderma*.

The present specimens show no outstanding morphological differences from *P. abyssorum*, as described by Odhner (1911a), and are therefore considered to belong to this species. There are, however, two minor differences, the first being the sparse gland-cells around the genital atrium and the second the presence of a ridge running transversely across the inner surface of the ventral sucker. This latter feature was not easy to detect in many whole mounts and may easily have been overlooked by Odhner.

***Neosteganoderma glandulosum*** Byrd, 1964, emend  
(Fig. 8)

*Proctophantastes glandulosa*: Yamaguti, 1971.

Host and locality: intestine of *Beryx decadactylus*, Stn. 37.

All the worms are contracted to a broadly pyriform shape, which tapers towards the anterior end. The length varies between 1 mm and 1.38 mm and the maximum width, which occurs at the level of the testes, between 0.76 mm and 0.96 mm. Anteriorly, the cuticle bears long, narrow spines which also occur near the posterior extremity. The subterminal oral sucker is rounded, 0.27–0.38 mm across by 0.26–0.33 mm long. At about the middle of the worm, or just behind, lies the transversely elongate ventral sucker, measuring 0.69–0.77 mm across by 0.27–0.33 mm long, reaching close to the lateral margins of the body on either side. The oral: ventral sucker width ratio is 1: 2.1–2.8, whilst the length of both suckers is almost the same. A small prepharynx can be seen in serial section. It enters a globular pharynx of about 0.11–0.13 mm diameter. The oesophagus is fairly short, curved dorsally to the pharynx, and bifurcates just posteriorly to the pharynx. The caeca are quite short, reaching to a position dorsal to the testes.

The excretory pore is terminally situated, or, when the worm is greatly distended with eggs, it may appear to be slightly dorsal. The saccular vesicle reaches as far as the posterior border of the ovary, and in this region part of it lies ventrally to the seminal receptacle.

On the left side of the body, submarginally and just anterior to the ventral sucker lies the genital pore. The genital atrium has a strong muscular wall, with irregular outpocketings. Into it leads a large cirrus-sac, the bulk of which lies just anterior to the ventral sucker and at right angles to the long axis of the worm. The cirrus-sac reaches transversely across the body to the right intestinal caecum, where it twists and runs slightly posteriorly towards the centre of the ventral sucker, in a plane dorsal to the remainder of the cirrus-sac. The relatively small, coiled internal seminal

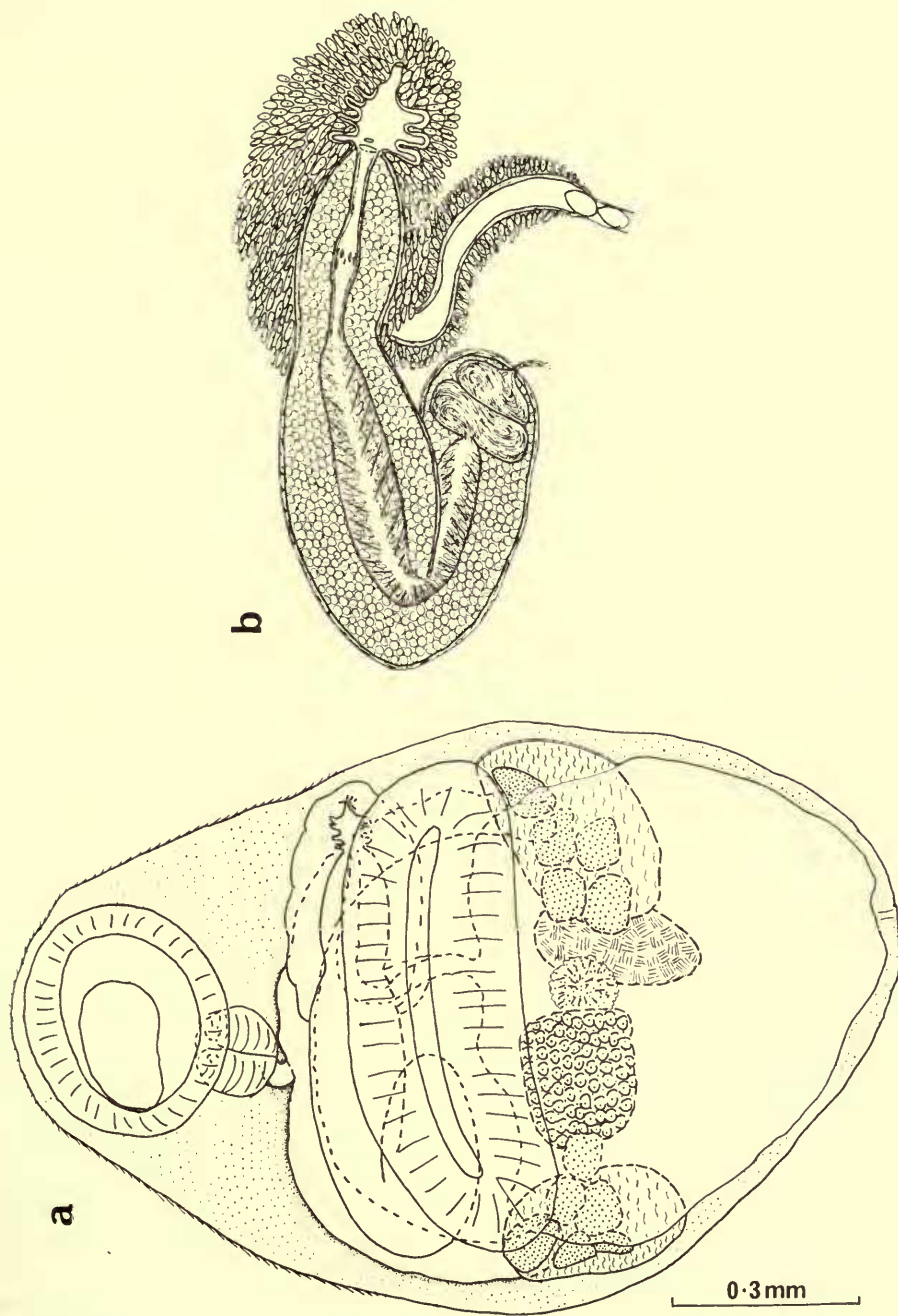


FIG. 8. *Neosteganoderma glandulosum* Byrd : a) ventral view omitting details of terminal genital apparatus ;  
b) terminal genital apparatus (diagrammatic).

vesicle leads into a well-developed pars prostatica, which, with its innumerable associated glands, fills most of the cirrus-sac. The muscular cirrus is shorter, containing some long, narrow spines, lying lengthwise, but as they have been seen clearly only in serial section the overall shape of these spines has not been made out. The testes are arranged symmetrically, just posterior to the ventral sucker and close to the lateral margins of the worm. Apparently, normally they are of an oval shape, but with growth of the uterus certain lobe-like processes appear. In one specimen the testes measured  $0.27 \times 0.3$  mm and  $0.4 \times 0.19$  mm.

Between the testes, and lying towards the right of the worm, is the ovary. In one specimen it was seen to be of an irregular quadrilateral shape,  $0.27 \times 0.27$  mm. The large, oval receptaculum seminis lies dorsally to the ovary and the left testis. It may measure  $0.3 \times 0.19$  mm. Ventral to the anterior extremity of the receptaculum seminis is a well-developed 'shell'-gland. The vitelline follicles are situated in two lateral fields, ventrally to the testes and reaching to about the posterior margin of the ventral sucker. Each field contains four to eight follicles. The egg-filled uterus occupies the great majority of the hindbody, obscuring the reproductive organs in this region. The metraterm is long and, particularly near the genital atrium, strongly muscular. It enters the latter from the dorsal side. For most of its length it is surrounded by an investment of gland-cells (Fig. 8b). Where the metraterm and the cirrus-sac run adjacent to each other the cells invest both organs and also surround the genital atrium. The operculate eggs measure  $26-31 \mu\text{m} \times 16-21 \mu\text{m}$ .

Byrd (1964) described *Neosteganoderma glandulosum* from a beryciform fish, *Polymixia lowei*, in the Straits of Florida. He differentiated his new genus from other zoogonids with follicular vitellaria situated posteriorly to the ventral sucker by a number of features. These included the posterior position of the ventral sucker and the elongate oesophagus and forebody, but as can be seen from the present contracted specimens these are not reliable features. It should be noted that Byrd's specimens were treated with chloreton in sea-water before fixation, which probably accounted for the relaxation of the forebody. The other distinguishing characteristics he mentions are the very large ventral sucker and the 'large glandular mass surrounding the genital pore'. The latter feature is very prominent in the present specimens and appears to be the most reliable feature for distinguishing *Neosteganoderma* from the closely-related genus *Steganoderma*. Yamaguti (1971), however, places Byrd's species in *Proctophantastes*, which, as pointed out above, does not possess a large mass of gland-cells surrounding the genital atrium. It appears that Yamaguti is basing his definition of *Proctophantastes* Odhner, 1911, not on its type-species, *P. abyssorum* Odhner, 1911, but on his own species *P. polymixiae* Yamaguti, 1970, from *Polymixia japonica* in the Pacific Ocean off Hawaii, which he describes as having a large 'peritrial gland'. This suggests that this species should become *Neosteganoderma polymixiae* (Yamaguti, 1970) n. comb. It seems possible that it may be found to be conspecific with *N. glandulosum*.

As stated above, certain features of the morphology of the present specimens are different from those described by Byrd, but these are considered to be due to the differences in the fixation technique used. The oesophagus in the present forms is

particularly reduced by comparison with the original description. Byrd's statement that the metraterm enters the genital atrium from the ventral side appears to be a typographical error, as a close examination of his figures shows that in his specimens, as in mine, the metraterm enters the genital atrium from the dorsal side.

Family **FELLODISTOMIDAE** Nicoll, 1913

(?) *Steringotrema divergens* (Rud, 1809) Odhner, 1911

(Fig. 9)

*Distoma divergens* Rud., 1809.

*Fasciola divergens*: de Blainville, 1820.

Host and locality: intestine of *Capros aper*, Stn. 38, Stn. 53.

Seven specimens were recovered from a fish at Stn. 38 and two from a fish at Stn. 53. These specimens are, unfortunately, rather contracted, but enough detail has been observed to suggest that they probably belong to *Steringotrema divergens*.

The worms are oval, often tapering at each end, and measure 0.75–1.2 mm long by 0.42–0.47 mm in maximum width at the level of the ventral sucker. The cuticle is unarmed. The subterminal oral sucker is 0.11–0.15 mm in diameter and leads into a globular pharynx of 0.09–0.11 mm diameter. Because of the contraction the oesophagus is curved, but it bifurcates just about the level of the genital pore, and the intestinal caeca extend to about the level of the testes. About halfway along the body lies the transversely-elongate ventral sucker, measuring 0.21–0.31 mm × 0.38–0.42 mm, giving an oral: ventral sucker ratio of about 1:2.7–3.6.

The excretory pore is terminal, and the vesicle is V-shaped, the limbs of which have been traced almost to the ventral sucker in serial sections.

About halfway between the suckers and just to the left of the median line lies the genital pore. The rather stout cirrus-sac, 0.18–0.19 mm long and 0.11–0.13 mm wide, contains a bipartite seminal vesicle leading into an elongate pars prostatica which passes from the anterior end of the seminal vesicle to near the posterior end of the cirrus-sac before turning and running anteriorly to unite with a short, muscular, smooth cirrus. Due to contraction of the body, the testes, the ovary and the egg-filled uterus are pressed closely against the ventral sucker. Thus, as the eggs are opaque, the testes and the ovary are discernible only in serial section. The testes lie symmetrically at the lateral margins of the body, with the ovary lying close to the right testis. The vitelline follicles are arranged in four groups, two on each side of the worm, one group anterior to the ventral sucker and the other group posterior to the sucker. The uterus fills almost the whole of the hindbody of the worm and contains numerous operculate eggs, 46–48  $\mu\text{m}$  × 33–37  $\mu\text{m}$  with shell about 2–3  $\mu\text{m}$  thick.

Any slight morphological differences which can be detected between the above description and those given by Odhner (1911b), Palombi (1931) and Mathias (1934) may probably be explained by the contraction of the present worms. The eggs, as measured when teased from the body as well as *in utero*, are rather wider than those

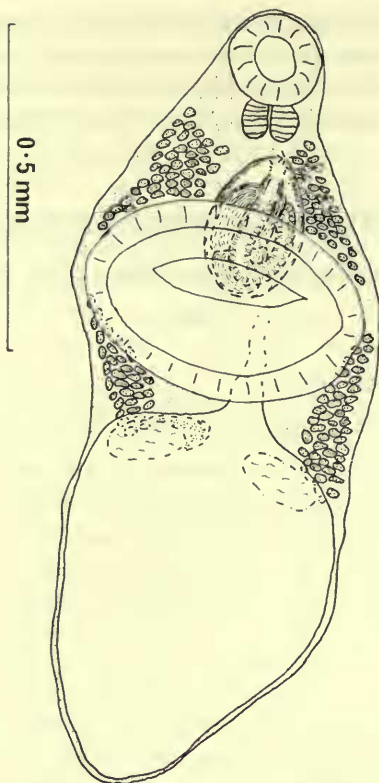


FIG. 9. (?) *Steringotrema divergens* (Rud.): diagrammatic ventral view with intestine omitted.

previously recorded. A more definite statement on the identity of these specimens awaits better-preserved material. It should be noticed that the previously-reported hosts of *S. divergens* (i.e. gobies and blennies) have a rather different biology from that of the present host.

***Steringophorus blackeri* sp. nov.**

(Fig. 10)

Hosts and localities : intestine and body-cavity of *Xenodermichthys copei* (type-host), Stn. 24 ; intestine of *Xenodermichthys* sp. indet., National Institute of Oceanography, Stn. 6429 - 28°07' N., 13°52' W. depth 0-390 m.

Four whole specimens were recovered from *X. copei*. One whole specimen and an anterior fragment were found in the body-cavity of the same fish specimen, the fish itself having itself been preserved in formalin. The remainder of the specimens from *X. copei* and the two specimens found in *X. sp. indet.* were taken from the intestine. The worms occurred either singly or in pairs in their hosts. The whole worm from the body-cavity (Fig. 10b) was of a shape and size rather different from



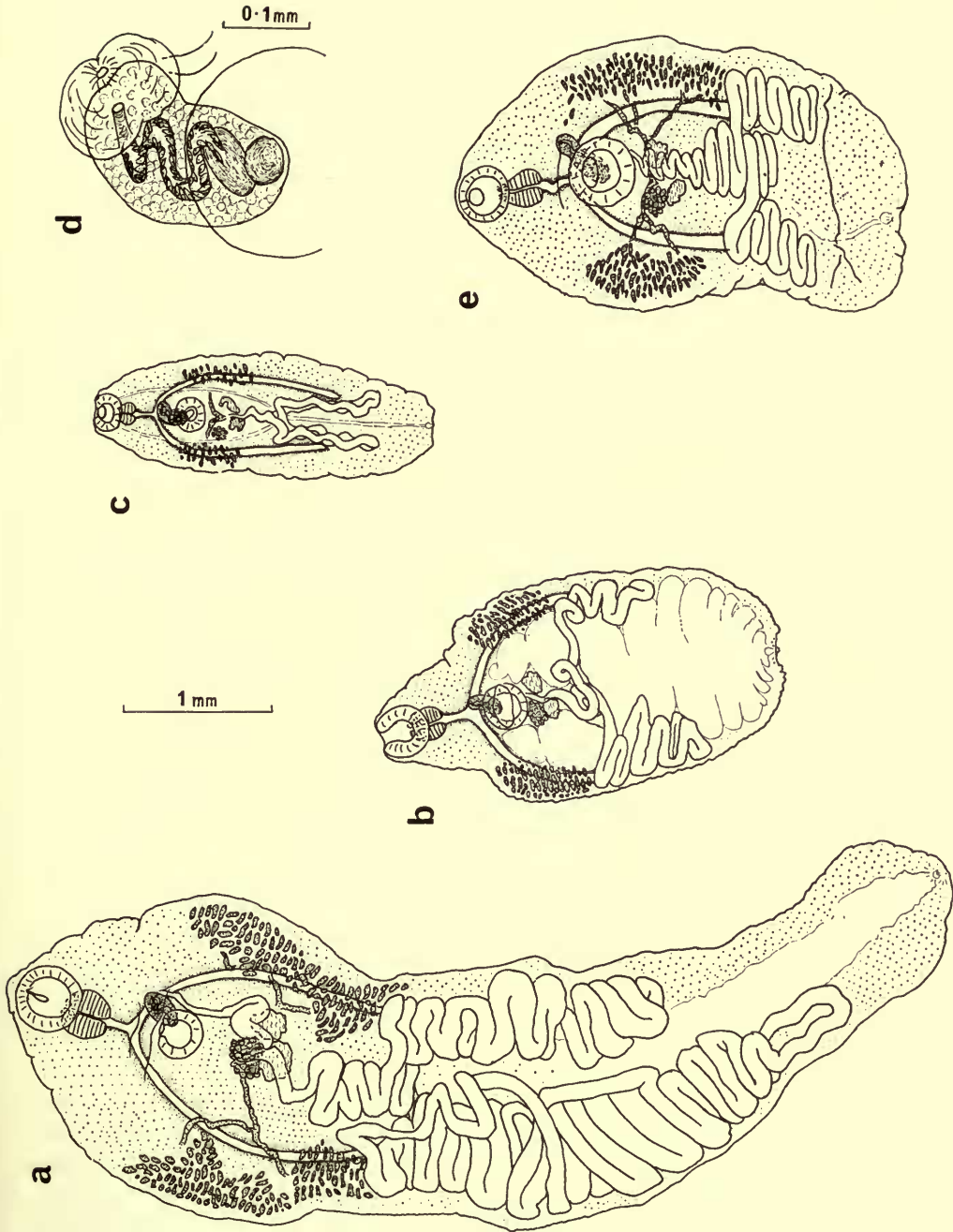


FIG. 10. *Steringophorus blackeri* sp. nov.: a) intestinal form from *Xenodermichthys copei* (ventral view); b) body-cavity form from *X. copei* (ventral view); c) young intestinal form from *X. sp. indet.* (ventral view); d) cirrus-sac and genital atrium of c; e) intestinal form from *X. sp. indet.* (ventral view).

those in the intestine (Fig. 10a), two of which were sectioned for further study. The other specimens, collected by the author from fishes in the collection of the National Institute of Oceanography, included one which was apparently young (Fig. 10c) and an older worm (Fig. 10e). Despite the variation in size, the internal morphology indicates clearly that all these specimens represent the same species.

The 'intestinal form' from *X. copei* is elongate, being widest just posteriorly to the ventral sucker, which is about one-fifth of the body-length from the anterior end. The forebody tapers sharply, while the tapering of the hindbody is less pronounced, and it is rounded terminally. The forms from *X. sp. indet* are much smaller, but with a similarly shaped forebody, and are widest just posteriorly to the ventral sucker (at about one-third of the body-length from the anterior end), the hindbody having slightly tapering lateral margins and a rather truncate posterior end. The 'body-cavity form' from *X. copei* has a similar forebody to the other forms, but the hindbody is considerably swollen by the large bulbous excretory vesicle, the limbs of which reach into the forebody, but do not appear to be swollen in the same way.

The dimensions of the various forms are included in Table 2.

TABLE 2

Measurements of *Steringophorus blackeri* sp. nov.

Host	<i>X. copei</i>	<i>X. copei</i>	<i>X. sp. indet.</i>	<i>X. sp. indet.</i>
'Form'	Intestinal	Body-cavity	Younger	Older
No. of specimens	3 (2 sectioned)	1 + fragment	1	1
Length (mm)	4.6-9	2.7	2.2	3.08
Width (mm)	2.03-2.04	1.45	0.8	1.68
Oral sucker diameter (mm)	0.47	0.34-0.35	0.243	0.4
Ventral sucker diameter (mm)	0.43	0.29-0.33	0.240	0.45
Oral : ventral sucker ratio	1 : 0.92	1 : 0.85-0.94	1 : 0.98	1 : 1.12
Pharynx (mm)	0.32 × 0.26	0.22-0.26 × 0.21-0.19	0.125 × 0.11	0.21 × 0.25
Oesophagus (mm)	0.13-0.23	0.14	0.105	0.16
Cirrus-sac (mm)	about 0.32-0.35 × 0.19	about 0.21-0.32 × 0.12	0.26 × 0.14	0.48 × 0.16
Ovary (mm)	0.27 dia.	0.21 × 0.16	0.18 × 0.11	0.21 × 0.19
Testes (mm)	about 0.21 × 0.18	0.11-0.12 × 0.16	0.07 - 0.13 × 0.14	0.13-0.14 × 0.17-0.2
Eggs (μm)	57-63 × 32-34	52-58 × 27-30	54 × 27-30	54-57 × 28-30

The cuticle bears no spines, but has numerous transverse wrinkles. The oral and ventral suckers are rounded, and with one exception the oral is slightly larger than the ventral. In some specimens from *X. copei* contraction has caused the opening of the ventral sucker to be disposed anteriorly. There is no prepharynx, so the almost globular pharynx abuts directly with the oral sucker. It leads into a fairly short oesophagus, which bifurcates at about the level of the anterior margin of the ventral sucker, or slightly further forward. The intestinal caeca are lined with a

glandular epithelium and run posteriorly to a point normally amidst the uterine coils where they terminate, about halfway along the hindbody.

The excretory pore is terminal and leads into a very small globular vesicle (of about 0.03–0.06 mm in diameter) before entering the main Y-shaped vesicle. The stem of the vesicle reaches to about the middle of the body, whilst the limbs reach anteriorly to the oral sucker. The stem may be very wide or narrow, but the limbs are constantly narrow. The excretory pore itself appears to be on a short protuberance at the base of a depression and is surrounded by glandular cells.

The genital pore is situated on a level with, or just anterior to, the intestinal bifurcation and slightly to the left of the median line. It leads into a muscular genital atrium. The cirrus-sac overlaps the anterior border of the ventral sucker and contains a relatively small, bipartite seminal vesicle, a long, coiled pars prostatica and a short muscular cirrus. The testes lie posteriorly to the ventral sucker a little obliquely to each other, with the left testis being slightly anterior to the right. They are close to the ovary and to each other, are small by comparison with the body-size and have more or less deeply indented margins. The multilobate ovary lies anteriorly and sometimes slightly obliquely to the right testis. It is associated with a large 'shell'-gland, about the same size as the ovary, lying between it and the left testis. Laurer's canal opens dorsally, level with the 'shell'-gland, and may contain a small amount of spermatozoa in its proximal region. Sperm may also lie in the proximal part of the uterus. The vitellaria consists of numerous globular or short transversely-elongate follicles disposed in two symmetrically placed fields near the lateral margins of the body. These fields reach from about the level of the anterior border of the ventral sucker to a position some distance posterior to the testes. The uterus runs in the median line from the ovary to about the middle of the worm, in a series of lateral coils. It then forms a descending series of loops on each side of the body to about two-thirds of the way along the hindbody before passing anteriorly again as a series of loops. It has not been possible to ascertain whether the uterus passes down one side of the body and then down the other, or whether it divides before passing down both sides. The later coils of the uterus pass forward in the median line ventrally to the descending coils and the gonads. In the specimens with the swollen excretory vesicle the lateral uterine slings are forced to lie close to the margins of the body. Within the uterus lie numerous eggs, many of which are collapsed, but which appear to be operculate, with a brownish-yellow shell. This shell is covered with numerous small bosses giving the surface a granular appearance, which is rather less marked in the young specimen from *X. sp. indet.*

**MATERIAL.** British Museum (Natural History) Reg. no. 1973.4.9.21–24 (syntypes).

Although some recent authors have followed Yamaguti (1953) in considering *Steringophorus* Odhner, 1905, a synonym of *Fellodistomum* Stafford, 1904, it would seem that there may be one feature differentiating these genera, if the distribution of the vitellaria is taken into consideration. In *Fellodistomum* the vitellaria extend anteriorly well beyond the ventral sucker, whilst in *Steringophorus* they do not. A close examination of material of the type-species of both genera from the type-hosts may well indicate other differences, particularly in the length of the caeca and the configuration of the fully-developed uterus.

This new species would appear to be most closely related to *Steringophorus magnus* Manter, 1934, from an unidentified eel-like fish in 300 fathoms at Tortugas, Florida. It differs, however, in the granular pattern of the egg-shell, in the sucker ratio, in the distribution of the vitellaria and in the configuration of the uterus in the hindbody. The sculpturing on the egg-shell seems to be similar to that described in *Benthotrema plenum* Manter, 1934, and it may be noted that although Manter (1934) originally considered this to be a generic character, later (1954) he described a further species in the genus, *B. richardsoni*, in which the eggs apparently have smooth shells.

Family **HEMIURIDAE** Lühe, 1901

***Hemiurus appendiculatus*** (Rud., 1802) Looss, 1899

Host and locality: stomach of *Alosa fallax*, Stn. 41.

Seven specimens were found. This is a common parasite of shads and has been recorded in *A. fallax* [*A. finta*] in various localities in the Mediterranean and north-eastern Atlantic. Nevertheless, *H. appendiculatus* of de Oliveira Rodrigues *et al.* (1972) recorded from *A. fallax* from the coast of Portugal may not belong to this species, as it has, judging from the authors' figure, a relatively short pars prostatica and an undivided seminal vesicle. The normal condition appears to be that represented by the present specimens, in which the pars prostatica is convoluted posteriorly to the ventral sucker, and in which the anterior part of the bipartite seminal vesicle has a thick muscular wall.

***Lecithocladium excisum*** (Rud., 1819) Lühe, 1901

Host and locality: stomach of *Scomber scombrus*, Stn. 44.

***Lecithochirium gravidum*** Looss, 1907

Host and locality: stomach of *Conger conger*, Stn. 7.

In their revision of *Lecithochirium* Lühe, 1901, Nasir and Diaz (1971) consider *L. gravidum* to be a synonym of *L. rufoviride* (Rud., 1819). These two species are certainly very similar morphologically and according to Looss (1908) and Guiart (1938) they are distinguishable only by size and sucker ratio. *L. gravidum* is small with an oral:ventral sucker ratio of about 1:2 whilst *rufoviride* is larger and has suckers of more or less equal size. The present specimens (six in number) have an oral sucker diameter of 0.24–0.29 mm and a ventral sucker diameter of 0.47–0.52 mm, and therefore a sucker ratio of 1:1.8–2.1. In an attempt to discover whether or not the sucker ratio in this group is influenced by allometric growth 60 specimens, assigned to one or other of these species, were measured. These specimens, from the collections of the British Museum (Natural History), were all from *Conger conger* collected at Plymouth and Guernsey. The sucker ratio was then plotted against the body-length as is shown in Fig. 11. As can be seen there are two distinct regions, one representing those specimens with a sucker ratio of more than 1:1.7 and the other representing those with a ratio of less than 1:1.6. Allometric growth does

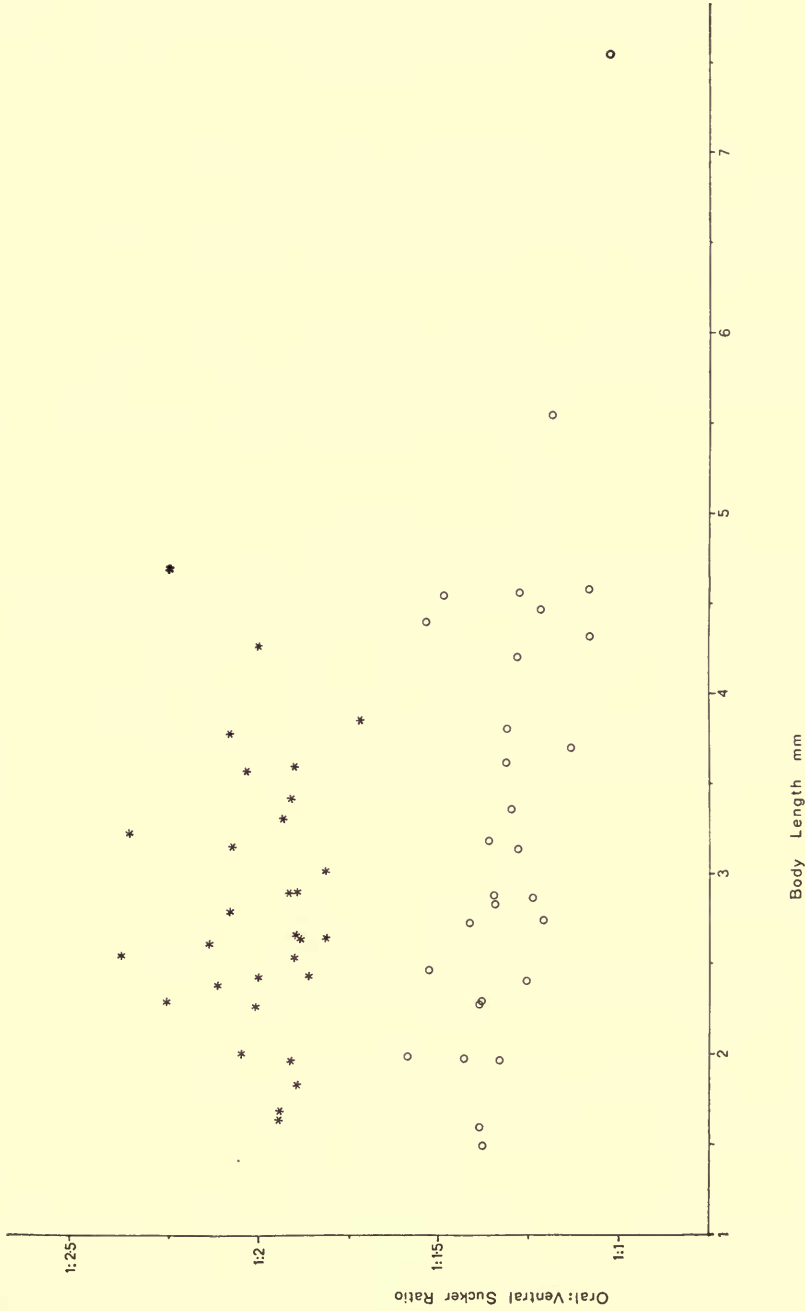


FIG. II. *Lecithochirium gyavidum* Looss and *L. rufoviride* (Rud.) : oral : ventral sucker ratio plotted against body length for 60 specimens (see p. 178).

TABLE 3  
Measurements of *Derogenes varicus* from various hosts

Host	No. of specimens	length (mm)	width (mm)	oral sucker dia. (mm)	ventral sucker dia. (mm)	eggs ( $\mu\text{m}$ )
<i>Molva macrophthalma</i>	1	0.95	0.31	0.14	0.28	52-54 x 28-29
<i>Trachyrhynchus trachyrincus</i>	2	1.18-1.2	0.36-0.45	0.17-0.2	0.32-0.35	52-54 x 30-33
<i>Micromesistius poulassou</i>	1	0.54	0.26	0.12	0.22	53-54 x 33
<i>Phycis blennoides</i>	9	0.53-1.04	0.32-0.33	0.14-0.17	0.23-0.25	52-57 x 29-33
<i>Merluccius merluccius</i>	19	0.53-0.79	0.26-0.33	0.13-0.16	0.23-0.27	52-54 x 29-30

not appear to have a significant effect on the sucker ratio. It can therefore be seen that, commonly occurring in *Conger conger*, there are two very similar species differing in their sucker ratio, if not in any other obvious feature. This information seems to uphold the validity of the species *L. gravidum*, to which the present specimens are assigned.

***Derogenes varicus*** (Müller, 1784) Looss, 1901

Hosts and localities: stomach of *Molva macrophthalma*, Stn. 43; stomach of *Trachyrhynchus trachyrincus*, Stn. 43; stomach of *Micromesistius poutassou*, Stn. 6; stomach of *Phycis blennoides*, Stn. 17; stomach of *Merluccius merluccius*, Stn. 8.

This parasite has been recorded from numerous fishes in polar and temperate waters of the world. This appears, however, to be the first record of this worm from *M. macrophthalma*, *T. trachyrincus* and *M. poutassou*. For this reason a table of important dimensions is given (Table 3).

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